

Tsunamis

Learn whether tsunamis have occurred in your area by contacting your local emergency management office, state geological survey, National Weather Service (NWS) office, or American Red Cross chapter. Find out your area's flooding elevation.

AWARENESS MESSAGES

Why talk about tsunamis?

All tsunamis are potentially dangerous however most do not cause significant damage. Twenty-four tsunamis have caused damage in the United States and its territories in the past 200 years. Since 1946, six tsunamis have killed more than 350 people and caused significant property damage in Hawaii, Alaska, and along the West Coast. Tsunamis have also occurred in Puerto Rico and the Virgin Islands. When a tsunami comes ashore, it can cause great loss of life and property damage. Tsunamis can travel upstream in coastal estuaries and rivers, with damaging waves extending farther inland than the immediate coast. A tsunami can occur during any season of the year and at any time, day or night.

What are tsunamis?

Tsunamis are large ocean waves generated by major earthquakes beneath the ocean floor or major landslides into the ocean. Tsunamis caused by nearby earthquakes may reach the coast within minutes. When the waves enter shallow water, they may rise to several feet or, in rare cases, tens of feet, striking the coast with devastating force. People on the beach or in low coastal areas need to be aware that a tsunami could arrive within minutes after a severe earthquake. The tsunami danger period can continue for many hours after a major earthquake.

Tsunamis also may be generated by very large earthquakes far away in other areas of the ocean. Waves caused by these earthquakes travel at hundreds of miles per hour, reaching the coast several hours after the earthquake. The International Tsunami Warning System monitors ocean waves after any Pacific earthquake with a magnitude greater than 6.5. If waves are detected, warnings are issued to local authorities who can order the evacuation of low-lying areas if necessary.

How can I protect myself from a tsunami?

If you are in a coastal community and feel the shaking of a strong earthquake, you may have only minutes until a tsunami arrives. **Do not wait for an official warning.** Instead, let the strong shaking be your warning, and, after protecting yourself from falling objects, quickly move away from the water and to higher ground. If the surrounding area is flat, move inland. Once away from the water, listen to a local radio or television station or NOAA Weather Radio for information from the Tsunami Warning Centers about further action you should take.

Even if you do not feel shaking, if you learn that an area has experienced a large earthquake that could send a tsunami in your direction, listen to a local radio or television station or NOAA Weather Radio for information from the Tsunami Warning Centers about action you should take. Depending on the location of the earthquake, you may have a number of hours in which to take appropriate action.

What is the best source of information in a tsunami situation?

As part of an international cooperative effort to save lives and protect property, the National Oceanic and Atmospheric Administration's National Weather Service operates two tsunami warning centers: the West Coast/Alaska Tsunami Warning Center (WC/ATWC) in Palmer, Alaska, and the Pacific Tsunami Warning Center (PTWC) in Ewa Beach, Hawaii. The WC/ATWC serves as the regional Tsunami Warning Center for Alaska, British Columbia, Washington, Oregon, and California. The PTWC serves as the regional Tsunami Warning Center for Hawaii and as a national/international warning center for tsunamis that pose a Pacific-wide threat.

Some areas, such as Hawaii, have Civil Defense Sirens. Turn on your radio or television to any station when the siren is sounded and listen for emergency information and instructions. Maps of tsunami-inundation areas and evacuation routes can be found in the front of local telephone books in the Disaster Preparedness Info section.

Tsunami warnings are broadcast on local radio and television stations and on NOAA Weather Radio. NOAA Weather Radio is the prime alerting and critical information delivery system of the National Weather Service (NWS). NOAA Weather Radio broadcasts warnings, watches, forecasts, and other hazard information 24 hours a day on more than 650 stations in the 50 states, adjacent coastal waters, Puerto Rico, the U.S. Virgin Islands, and the U.S. Pacific territories.

The NWS encourages people to buy a weather radio equipped with the Specific Area Message Encoder (SAME) feature. This feature automatically alerts you when important information is issued about tsunamis or weather-related hazards for your area. Information on NOAA Weather Radio is available from your local NWS office or at www.nws.noaa.gov/nwr.

Carry the radio with you when you go to the beach and keep fresh batteries in it.

Warning, Watch

A Tsunami WARNING means a dangerous tsunami may have been generated and could be close to your area. Warnings are issued when an earthquake is detected that meets the location and magnitude criteria for the generation of a tsunami. The warning includes predicted tsunami arrival times at selected coastal communities within the geographic area defined by the maximum distance the tsunami could travel in a few hours.

A Tsunami WATCH means a dangerous tsunami has not yet been verified but could exist and may be as little as an hour away. A watch—issued along with a tsunami warning—predicts additional tsunami arrival times for a geographic area defined by the distance the tsunami could travel in more than a few hours.

The West Coast/Alaska Tsunami Warning Center and the Pacific Tsunami Warning Center issue watches and warnings to the media and to local, state, national, and international officials. NOAA Weather Radio broadcasts tsunami information directly to the public.

Local officials are responsible for formulating, disseminating information about, and executing evacuation plans in case of a tsunami warning.

Is your community StormReady? To help people prepare for the ravages of hazardous weather, the National Weather Service has designed StormReady, a program aimed at arming America's communities with the communication and safety skills necessary to save lives and property. More information is available at www.stormready.noaa.gov/.

Is your community Tsunami Ready? Tsunami Ready is a program that promotes tsunami hazard readiness as an active collaboration among federal, state, and local emergency management agencies; the public; and the National Weather Service tsunami warning system. This collaboration supports better and more consistent tsunami awareness and mitigation efforts among communities at risk. The main goal is improvement of public safety during tsunami emergencies.
More information is available at <http://wcatwc.gov/tsunamiready/tready.htm>.

ACTION MESSAGES

Be Prepared for Tsunamis Protect Yourself

Core Action Messages

- **Determine your risk.**
- **Prepare members of your household.**
- **Learn and practice evacuation routes.**

For general preparedness, every household should create and practice a Family Disaster Plan and assemble and maintain a Disaster Supplies Kit. In addition, every household in coastal areas should take tsunami-specific precautions and plan for and practice what to do in a tsunami situation.

Be aware of signs that can mean a tsunami may be approaching:

- A strong earthquake lasting 20 seconds or more near the coast.
- A noticeable rapid rise or fall in coastal waters.

If you are in an area at risk from tsunamis, you should:

- **Find out if your home, school, workplace, or other frequently visited locations are in tsunami hazard areas.**
- **Know the height of your street above sea level and the distance of your street from the coast or other high-risk waters.** Evacuation orders may be based on these numbers. Also find out the height above sea level and the distance from the coast of outbuildings that house animals, as well as pastures or corrals.
- **Plan evacuation routes from your home, school, workplace, or any other place you could be where tsunamis present a risk.** If possible, pick areas 100 feet (30 meters) above sea level or go as far as two miles (3 kilometers) inland, away from the

coastline. If you cannot get this high or far, go as high or far as you can. Every foot inland or upward may make a difference. You should be able to reach your safe location on foot within 15 minutes. After a disaster, roads may become impassable or blocked. Be prepared to evacuate by foot if necessary. Footpaths normally lead uphill and inland, while many roads parallel coastlines. Follow posted tsunami evacuation routes; these will lead to safety. Local emergency management officials can advise you on the best route to safety and likely shelter locations.

- **If your children's school is in an identified inundation zone, find out what the school evacuation plan is.** Find out if the plan requires you to pick your children up from school or from another location. Telephone lines during a tsunami watch or warning may be overloaded and routes to and from schools may be jammed.
- **Practice your evacuation routes.** Familiarity may save your life. Be able to follow your escape route at night and during inclement weather. Practicing your plan makes the appropriate response more of a reaction, requiring less thinking during an actual emergency situation.
- **Use a NOAA Weather Radio or stay tuned to a local radio or television station to keep informed of local watches and warnings.**
- **Talk to your insurance agent.** Homeowners' policies do not cover flooding from a tsunami. Ask about the National Flood Insurance Program (NFIP) (www.fema.gov/nfip). NFIP covers tsunami damage, but your community must participate in the program.
- **Discuss tsunamis with your family.** Everyone should know what to do in a tsunami situation. Discussing tsunamis ahead of time will help reduce fear and save precious time in an emergency. Review flood safety and preparedness measures with your family.

If you are visiting an area at risk from tsunamis, check with the hotel, motel, or campground operators for tsunami evacuation information and find out what the warning system is for tsunamis. It is important to know designated escape routes before a warning is issued.

Protect Your Property

CORE ACTION MESSAGE

- **Actively protect your home.**

If you are at risk from tsunamis, you should:

- **Avoid building or living in buildings within several hundred feet of the coastline.** These areas are more likely to experience damage from tsunamis, strong winds, or coastal storms. For more information, check out the Institute for Business and Home Safety at www.ibhs.org.
- **Make a list of items to bring inside in the event of a tsunami.** A list will help you remember anything that can be swept away by tsunami water.
- **Elevate coastal homes.** Most tsunami waves are less than 10 feet (3 meters). Elevating your house will help reduce damage to your property from most tsunamis.
- **Take precautions to prevent flooding.** (See "[Floods and Flash Floods](#)")
- **Have an engineer check your home and advise about ways to make it more resistant to tsunami water.** There may be ways to divert waves away from your property. Improperly built walls could make your situation worse. Consult with a professional for advice.

- **Ensure that any outbuildings, pastures, or corrals are protected in the same way as your home.** When installing or changing fence lines, consider placing them in such a way that your animals are able to move to higher ground in the event of a tsunami.

What to Do if You Feel a Strong Coastal Earthquake

CORE ACTION MESSAGE

- **Drop, cover, and hold on; then climb to higher ground.**

If you feel an earthquake that lasts 20 seconds or longer when you are in a coastal area, you should:

- **Drop, cover, and hold on.** You should first protect yourself from the earthquake. (See [“Earthquakes”](#))
- **When the shaking stops, gather members of your household and move quickly to higher ground away from the coast.** A tsunami may be coming within minutes.
- **Avoid downed power lines and stay away from buildings and bridges** from which heavy objects might fall during an aftershock.

What to Do When a Tsunami Watch Is Issued

CORE ACTION MESSAGES

- **Stay informed.**
- **Be ready to evacuate.**

You should:

- **Use a NOAA Weather Radio or stay tuned to a Coast Guard emergency frequency station, or a local radio or television station for updated emergency information.** Most tsunami detection equipment is located at the coast. Seismic action may be the only advance warning before a tsunami approaches the coastline.
- **Check your [Disaster Supplies Kit](#).** Some supplies may need to be replaced or restocked.
- **Locate household members and review evacuation plans.** Make sure everyone knows there are a potential threat and the best way to safer ground.
- **If any members of your household have special evacuation needs (small children, elderly people, or people with disabilities) consider evacuating early.**
- **If time permits, secure unanchored objects around your home or business.** Tsunami waves can sweep away loose objects. Securing these items or moving them inside will reduce potential loss or damage.
- **Be ready to evacuate.** Being prepared will help you to move more quickly if a tsunami warning is issued.
- **Bring your companion animals indoors and maintain direct control of them.** Be sure that your pet disaster kit is ready to go in case you need to evacuate.
- **Consider a precautionary evacuation of your animals,** especially any large or numerous animals. Waiting until the last minute could be fatal for them and dangerous for you. Where possible, move livestock to higher ground. If you are using a horse or

other trailer to evacuate your animals, move early rather than wait until it may be too late to maneuver a trailer through slow traffic.

What to Do When a Tsunami Warning Is Issued

CORE ACTION MESSAGES

- Stay informed.
- Climb to higher ground.

- **Use a NOAA Weather Radio or stay tuned to a Coast Guard emergency frequency station, or a local radio or television station for updated emergency information.**
- **Follow instructions issued by local authorities.** Recommended evacuation routes may be different from the one you planned, or you may be advised to climb higher. Remember, authorities will issue a warning only if they believe there is a real threat from tsunami.
- If you are in a tsunami risk area, do the following:
 - If you hear an official tsunami warning or detect signs of a tsunami, evacuate at once.** A tsunami warning is issued when authorities are certain that a tsunami threat exists, and there may be little time to get out.
 - Take your Disaster Supplies Kit.** Having supplies will make you more comfortable during the evacuation.
 - Get to higher ground as far inland as possible.** Officials cannot reliably predict either the height or local effects of tsunamis. Watching a tsunami from the beach or cliffs could put you in grave danger. If you can see the wave, you are too close to escape it.
 - Return home only after local officials tell you it is safe.** A tsunami is a series of waves that may continue for hours. Do not assume that after one wave the danger is over. The next wave may be larger than the first one. In several cases, people survived the first wave and returned to homes and businesses only to be trapped and killed by later, sometimes larger, waves in the series.
- **If you evacuate, take your animals with you.** If it is not safe for you, it is not safe for your animals.

If you cannot escape a wave, climb onto a roof or up a tree, or grab a floating object and hang on until help arrives. Some people have survived tsunami waves by using these last-resort methods.

What to Do After a Tsunami

CORE ACTION MESSAGES

- Stay informed.
- Take care of yourself and help others.
- Watch for hazards.

After a tsunami, you should:

- **Continue using a NOAA Weather Radio or staying tuned to a Coast Guard emergency frequency station or a local radio or television station for updated emergency information.** The tsunami may have damaged roads, bridges, or other

places that may be unsafe.

- **Check yourself for injuries and get first aid if necessary before helping injured or trapped persons.**
- **If someone needs to be rescued, call professionals with the right equipment to help.** Many people have been killed or injured trying to rescue others in flooded areas.
- **Help people who require special assistance**—infants, elderly people, those without transportation, large families who may need additional help in an emergency situation, people with disabilities, and the people who care for them.
- **Avoid disaster areas.** Your presence might hamper rescue and other emergency operations and put you at further risk from the residual effects of floods, such as contaminated water, crumbled roads, landslides, mudflows, and other hazards.
- **Use the telephone only for emergency calls.** Telephone lines are frequently overwhelmed in disaster situations. They need to be clear for emergency calls to get through.
- **Stay out of a building if water remains around it.** Tsunami water, like floodwater, can undermine foundations, causing buildings to sink, floors to crack, or walls to collapse.
- **When re-entering buildings or homes, use extreme caution.** Tsunami-driven floodwater may have damaged buildings where you least expect it. Carefully watch every step you take.
- **Wear long pants, a long-sleeved shirt, and sturdy shoes.** Sturdy shoes protect against injuries or cut feet.
- **Use battery-powered lanterns or flashlights when examining buildings.** Battery-powered lighting is the safest and easiest to use. **DO NOT USE CANDLES.**
- **Examine walls, floors, doors, staircases, and windows to make sure that the building is not in danger of collapsing.**
- **Inspect foundations for cracks or other damage.** Cracks and damage to a foundation can render a building uninhabitable.
- **Look for fire hazards.** There may be broken or leaking gas lines, flooded electrical circuits, or submerged furnaces or electrical appliances. Flammable or explosive materials may have come from upstream. Fire is the most frequent hazard following floods.
- **Check for gas leaks.** If you smell gas or hear a blowing or hissing noise, open a window and get everyone outside quickly. Turn off the gas using the outside main valve if you can, and call the gas company from a neighbor's home. If you turn off the gas for any reason, it must be turned back on by a professional.
- **Look for electrical system damage.** If you see sparks or broken or frayed wires, or if you smell burning insulation, turn off the electricity at the main fuse box or circuit breaker. If you have to step in water to get to the fuse box or circuit breaker, call an electrician first for advice. Electrical equipment should be checked and dried before being returned to service.
- **Check for damage to sewage and water lines.** If you suspect sewage lines are damaged, avoid using the toilets and call a plumber. If water pipes are damaged, contact the water company and avoid using water from the tap. You can obtain safe water from undamaged water heaters or by melting ice cubes that were made before the tsunami hit. Turn off the main water valve before draining water from these sources. **Use tap water only if local health officials advise it is safe.** (See "[Food and Water Safety During/Post Disaster](#)")
- **Watch out for wild animals,** especially poisonous snakes, that may have come into buildings with the water. Use a stick to poke through debris. Tsunami floodwater flushes

snakes and animals out of their homes.

- **Watch for loose plaster, drywall, and ceilings that could fall.**
- **Take pictures of the damage**, both of the building and its contents, for insurance claims.
- **Open the windows and doors to help dry the building.**
- **Shovel mud before it solidifies.**
- **Check food supplies.** Any food that has come in contact with floodwater may be contaminated and should be thrown out. (See "[Food and Water Safety During/Post Disaster](#)")
- **Expect aftershocks** if the earthquake was very large (magnitude 8 to 9+ on the Richter scale) and located nearby. Some aftershocks could be as large as magnitude 7+ and capable of generating another tsunami. The number of aftershocks will decrease over the course of several days, weeks, or months depending on how large the main shock was.
- **Watch your animals closely.** Keep all your animals under your direct control. Hazardous materials abound in flooded areas. Your pets may be able to escape from your home or through a broken fence. Pets may become disoriented, particularly because flooding usually affects scent markers that normally allow them to find their homes. The behavior of pets may change dramatically after any disruption, becoming aggressive or defensive, so be aware of their well-being and take measures to protect them from hazards, including displaced wild animals, and to ensure the safety of other people and animals.

Media and Community Education Ideas

- If your community is at risk, build tsunami evacuation routes and publicize their locations. Post signs directing people to higher ground away from the coast.
- Review land use in tsunami hazard areas so no new critical facilities, such as hospitals and police stations; high-occupancy buildings, such as auditoriums or schools; or petroleum-storage tank farms are built where there is a tsunami hazard. Consider relocating existing critical facilities outside the tsunami hazard area when opportunities arise, or at least explore ways to reinforce facilities and structures, such as critical bridges needed for evacuation. Tsunami damage can be minimized through land use planning, preparation, and evacuation.
- Ask your local newspaper or radio or television station to:
 - Do a series on the dangers of tsunamis and floods.
 - Do a story featuring interviews with local officials about land use management and building codes in floodplains.
 - Highlight the importance of staying informed about local conditions.
 - Run public service ads about how to protect lives and property in a tsunami.

Help the reporters to localize the information by providing them with the local emergency telephone number for the fire, police, and emergency medical services departments (usually 9-1-1) and emergency numbers for the local utilities and hospitals. Also provide the business telephone numbers for the local emergency management office, local American Red Cross chapter, and state geological survey or department of natural resources.

- Work with officials of the local fire, police, and emergency medical services departments; utilities; hospitals; emergency management office; and American Red Cross chapter to prepare and disseminate guidelines for people with mobility impairments about what to do if they have to evacuate.
- Periodically inform your community about local public warning systems.
- Interview local officials and insurance companies about the types of insurance that cover flood-related losses. Include information on the economic effects of disaster.

Facts and Fiction

Fiction: Tsunamis are giant walls of water.

Facts: Tsunamis normally have the appearance of a fast-rising and fast-receding flood. They can be similar to a tide cycle occurring over 10 to 60 minutes instead of 12 hours. Occasionally, tsunamis can form walls of water, known as tsunami bores, when the waves are high enough and the shoreline configuration is appropriate.

Fiction: A tsunami is a single wave.

Facts: A tsunami is a series of waves. Often the initial wave is not the largest. The largest wave may occur several hours after the initial activity starts at a coastal location. There may also be more than one series of tsunami waves if a very large earthquake triggers local landslides. In 1964, the town of Seward, Alaska, was devastated first by local tsunamis caused by submarine landslides resulting from the earthquake and then by the earthquake's main tsunami. The local tsunamis began even as people were still experiencing the shaking. The main tsunami, triggered at the site of the earthquake, did not arrive for several hours.

Fiction: A tsunami is the same thing as a tidal wave.

Facts: Tidal waves are regular ocean waves, and are caused by the tides. These waves are caused by the interaction of the pull of the moon's gravity on the earth. A "tidal wave" is a term used in common folklore to mean the same thing as a tsunami, but is not the same thing.

Fiction: Boats should move to the protection of a bay or harbor during a tsunami.

Facts: Tsunamis are often most destructive in bays and harbors, not just because of the waves but because of the violent currents they generate in local waterways. Tsunamis are least destructive in deep, open ocean waters.